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Mental representation of events: an investigation of agrammatic aphasia

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Introduction

Several studies indicate that sentence processing engages mental simulation of the event conveyed by the sentence, creating a "mental microworld" (Magliano & Schleich 2000). This simulation is found to be mediated by the extent to which the event is "ongoing". Hence sentences in imperfective aspect show stronger evidence of mental simulation than perfectives. Given that the temporal progression of an event can be expressed with grammatical aspect and tense, it is unclear if tense influences mental simulations, and how tense and aspect effects are graded.

Difficulties in the production of tense are well-documented in persons with post-stroke agrammatic aphasia, and there is some evidence for impaired tense comprehension (Faroqi-Shah & Dickey, 2009). The underlying source of these tense deficits has been elusive. These tense deficits could arise from inadequate activation of event representations in persons with agrammatic aphasia, a hypothesis that had not yet been systematically investigated.

The present study has two main aims. First, we investigate the neurotypical effects of tense and aspect on event representations during online sentence processing. Second, we examine if persons with agrammatic aphasia deviate from the neurotypical pattern. On the assumption that mental simulation facilitates sentence processing, we predict that simulation of event representations is graded by the temporal remoteness of the event: hence ongoing and current events (present, simple and progressive) will be processed faster than complete events (past and perfect).

Methods

The participants are thirty-two neurotypical adults (Mean age= 19.5 years, 10 males) and four persons with aphasia (PWA) following left perisylvian stroke (mean age=63.7 years, 2 males, 3 with agrammatic production and 1 without, Mean Western Aphasia Battery AQ= 76.6, Mean comprehension=7.7/10). Data collection for more persons with aphasia is ongoing. The experimental task involves sensibility judgment (*Does it make sense?*). The stimuli include twenty critical sentences with transitive telic verbs for each of six tense/aspect combinations (simple past, past progressive, past perfect, simple present, present progressive, present perfect) and fillers (480 sentences total).

Results and Discussion

Neurotypical and PWA accuracies exceeded 96% (Mean PWA d-prime=2.87). Neurotypical persons

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showed a main effect of aspect on log-transformed reaction times (ANCOVA controlling for Mean sentence length, ($F(2,3711)=26.42$, $p<0.001$, simplep>0.05; Figure 1). While the non-agrammatic PWA showed the neurotypical pattern ($p<0.05$, although with slower overall reaction times), the three agrammatic PWA showed no sensitivity to aspectual differences (single participant statistics procedures by Crawford & Garthwaite, 2002). These findings imply that deficiency with construction of mental representation of events is a possible source of tense deficits in agrammatic aphasia. Further validation with a larger group of participants is
ongoing.

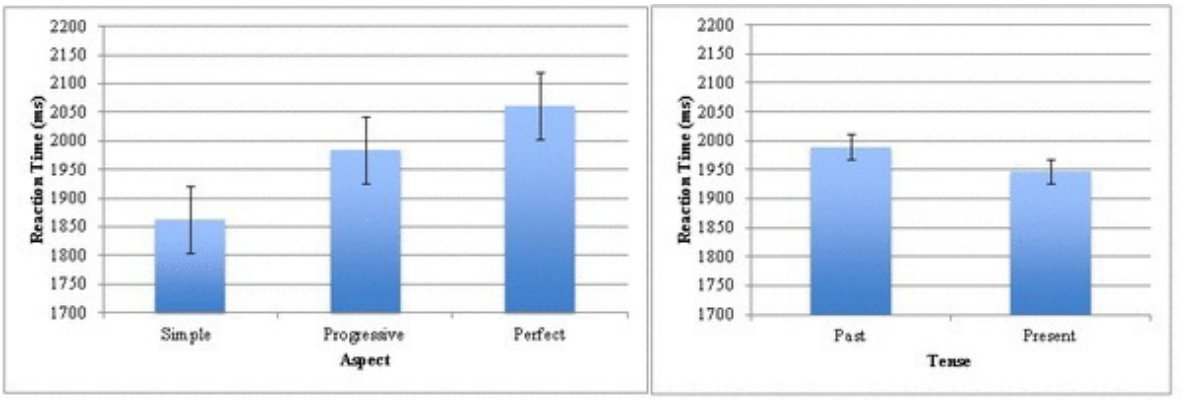

Figure 1. Neurotypical adults' mean reaction times for (a) simple, progressive, and perfect aspect (pooled over two tenses), (b) past and present tense (pooled over three aspects) * = $p<0.05$, standard error bars. This reaction time pattern was not found for persons agrammatic aphasia (N=3) but was found in a matched person with no agrammatic production.

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